EMF equation of alternator

By Faraday's law $e = \frac{d\phi}{dt} \times 1$ → For ① conductor.

Let:

Time taken to complete 1 revolution $= t = \frac{\text{dist}}{\text{speed}} = \frac{1}{n}$ seconds

$= \frac{1}{N} \times 60$

$= \frac{60}{N}$

Flux cut in 1 revolution $= P\phi$

$e = \frac{P\phi N}{60} \Rightarrow \frac{P\phi N}{60} \times \frac{2}{2} = \frac{2P\phi N}{120} = 2\phi f.$

$\left[N = \frac{120f}{P} \Rightarrow f = \frac{PN}{120}\right]$

ℓ . R.M.S = Form factor × Avg = 1.11 (for sine wave) × $2\phi f = e_{RMS}$

$e_{RMS} = 2.22\phi f$

For Z conductors ; $e = 2.22\phi Z f$; $Z = 2xT$

$e = 4.44\phi Z f T.$

If winding is short pitch or distributed we must include that factors

$e = 4.44\ \phi\ f T K_c K_d.$ //